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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/813,390
Filing Date: March 31, 2004
Appellant(s): GAUDET ET AL.

Edwin D. Garlepp
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 16 December 2008 appealing from the Office action mailed 25 January 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US 6,545,245 B2	YEH et al.	04-2003
US 2004/0109263 A1	SUDA et al.	06-2004
US 7,041,608 B2	SIEBER et al.	09-2006
US 6,057,247	IMAI et al.	05-2000
US 5,403,434	MOLESHI	04-1995

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3-4, 7-8, 10-23 and 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yeh et al. (US 6545245) in view of Suda et al. (US 2004/0109263) and in further view of either Sieber et al. (US 7041608) or Imai et al. (US 6057247).

As to claims 1, 7 and 27-30, Yeh et al. discloses a method for removing a photo resist based polymer residue from a plasma processing system including introducing a process gas into the process chamber, generating a plasma from the process gas (abstract), and exposing the residue to a wafer less dry cleaning process to form volatile reaction product without a shield wafer to clean the substrate holder (column 5 et seq.), and exhausting the reaction product from the process chamber (it is obvious that this occurs due to the pressures cited in column 4 et seq. and the implied use of vacuum

pumps). Yeh et al. does not include cleaning a fluorocarbon residue (though this may be recognized as a fluoropolymer residue) and using CO gas to generate the plasma (instead Yeh et al. uses oxygen gas to generate the plasma in column 4 lines 10-30). Suda et al. teaches that CO gas or CO with nitrogen and argon may be used as an alternative to oxygen gas to generate oxygen plasma (paragraph 0082). This limitation would have been obvious because the substitution of one known element, such as oxygen to from oxygen plasma, for another, such as CO or CO_2 that is taught as an alternative to oxygen by Suda et al., would have yielded predictable results and his therefore obvious to one of ordinary skill in the art at the time of the invention. See *KSR International Co. v. Teleflex Inc.*, 550 U.S.--, 82 USPQ2d 1385 (2007). In addition, it is well known in the art that as both nitrogen and argon are inert gases, a mixture of the two gases substituted for one or the other also yields predictable results and is obvious. Sieber et al. and/or Imai et al. teach that oxygen plasma is effective in removing fluorocarbon residue (Sieber et al. column 11 lines 10-17 and Imai et al. column 19 lines 25-35). Therefore, it would have been obvious at the time of the invention to modify Yeh et al. to use CO gas to generate the oxygen plasma as taught by Suda et al. as an alternative recognized in the art to clean fluorocarbon residue from the chamber as taught by Sieber et al. and Imai et al.

Regarding claim 3, Yeh et al. includes the substrate in the reaction chamber in column 5 et seq. and alternatively, Imai et al. includes the substrate in the process chamber for cleaning (entire document).

As to claim 4, Yeh et al. includes at least one manufacturing process before the cleaning is repeated (column 1 et seq. and column 2 lines 1-31).

As to claims 8, 10, 13-14, and 17-18, the claimed process gas flow rates, exposure times and chamber pressures are disclosed by Yeh et al. column 4 lines 20-31. Further, the exposure times are rendered a result effective variable by Yeh et al. in column 4 lines 20-61 and is modified depending upon the type of film cleaned, or etched from the chamber.

As to claims 11 and 12, inert gas including nitrogen or argon with the process gas CO is present in Suda et al. paragraph 0082. Sieber et al. teaches that modifying gases in the plasma (at it follows that their amounts are modified as well) in order to ensure that the fluorocarbon residue is etched or cleaned (column 11 lines 10-18), rendering this variable result-effective. Imai et el. Includes total gas flows, which would include the inert gas flows, in the Embodiments. It is also noted by the examiner that since claim 12 only requires less than 2000 sccm, it would also include a flow rate of 0 sccm.

As to claims 15 and 16, the RF power, and hence corresponding frequencies, is disclosed by Yeh et al. in columns 4-5 lines 62-14. It is clear from this passage that the RF power is adjusted depending upon conditions in order to ensure that the desired parts of the process chamber are cleaned. Therefore, this variable is result-effective and its modification is obvious.

Regarding claims 19-23, Yeh et al. does not include optical monitoring. However, Imai et al. teaches optical monitoring is used for fluorine or carbon monoxide

to check the progress of the process and stop the cleaning of the walls, where it is inherent that one could stop the plasma here if only cleaning the walls was desired (Imai column 6 lines 54-65, column 11 lines 31-67). Therefore, it would have been obvious to one of ordinary skill in the art to modify Yeh et al. to include optical monitoring as taught by Imai et al. in order to check the progress of the cleaning process.

Claims 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yeh et al. (US 6545245) in view of Suda et al. (US 2004/0109263) and Sieber et al. (US 7041608) or Imai et al. (US 6057247). as applied above, and further in view of US Patent number 5403434 to Moleshi.

Yeh et al., Suda et al. and Sieber et al. or Imai et al. are discussed above, but do not include using mass, particle, or plasma monitoring methods to monitor the cleaning process progress. Moleshi teaches adjusting several parameters including these using a process control computer in order to reduce the cleaning exposure time (column 9 line 18-column 15 line 33).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Yeh et al., Suda et al. and Sieber et al. or Imai et al. to include using mass, particle, or plasma monitoring methods to monitor the cleaning process progress as taught by Moleshi in order to reduce the cleaning exposure time.

(10) Response to Argument

Applicant's arguments filed 16 December 2008 have been fully considered but they are not persuasive.

The applicant argues that Suda et al., in the combination of 35 USC 103 references teaches using CO or CO_2 to generate oxygen plasma, but teaches it to etch a substrate and not to clean a plasma chamber. However, Yeh et al., the primary reference does teach cleaning a process chamber, and therefore with the other references as combined in the previous office action teach the limitations of claim 1 (among others). Suda et al. is primarily used to show that CO or CO_2 can also generate oxygen plasma for use in Yeh et al. (or the other secondary references) instead of using oxygen. It is further noted that etching a substrate, which Suda et al. is doing, is the same thing as cleaning the substrate, etching is usually just done in a more controlled fashion. With Yeh et al. one of ordinary skill in the art could easily see that the plasma may be used to clean the entire chamber. The functional result of this process, the oxygen plasma that is used to clean the chamber, remains oxygen plasma whether or not molecular oxygen (in the case of Yeh et al.) or CO or CO_2 or another gas mentioned by Suda et al. is used to make the plasma.

The applicant also argues that there is no advantage to using CO or CO_2 over other "broad range" of oxygen-containing gases included in the reference. However, Suda et al. does not cite a "broad range" of oxygen-containing gases, rather in paragraph 0082 Suda et al. discloses a small group of gases that may be used as alternatives to oxygen when making oxygen plasma. Further, the limitation of using CO

or CO_2 would have been obvious because the substitution of one known element, such as oxygen to from oxygen plasma, for another, such as CO or CO_2 that is taught as an alternative to oxygen by Suda et al., would have yielded predictable results and is therefore obvious to one of ordinary skill in the art at the time of the invention. See *KSR International Co. v. Teleflex Inc.,* 550 U.S.--, 82 USPQ2d 1385 (2007). Though the applicant cites advantages the applicants have found in relation to using CO and CO_2 in the chamber cleaning process, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter.1985). These advantages that the applicant cites by using the instant drawings are not convincing. The data in the figures are taken with several different pressures as seen in Figure 6. From just the data given, it is impossible to see whether or not the differing results are from the mixture of gases or just the pressure differentials.

In regards to one of the alternative tertiary references, Sieber et al., the applicant argues that Sieber et al. does not use CO or CO_2 as a cleaning gas, and also uses the oxygen plasma to etch a substrate. As stated before, etching is a cleaning process. It removes what is intended by the inventor. In the case of Sieber et al., the oxygen plasma removes fluorocarbon polymer (as the claim requires). The functional result of this process, the oxygen plasma that is used to clean the chamber or etch the substrate, remains oxygen plasma whether or not molecular oxygen (in the case of Yeh et al.) or CO or CO_2 or another gas mentioned by Suda et al. is used to make the plasma. In

combination with the other references, Suda et al. shows that the oxygen plasma may also be made by CO or CO_2, and Yeh et al. shows that oxygen plasma may be used to clean an entire chamber, and Sieber et al. shows that the oxygen plasma cleans fluorocarbon polymer. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In regards to the other alternative tertiary references, Imai et al., the applicant similarly argues that Imai et al. uses molecular oxygen in a gas mixture to make the oxygen plasma. Imai et al. teaches that oxygen plasma is functional in cleaning fluorocarbon polymer chamber residue. Suda et al. gives alternatives to using molecular oxygen to make oxygen plasma, as was stated above. Therefore, in combination with the other references, the prior art meets the claim(s). One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The applicant further argues that while Yeh et al. teaches a wafer less cleaning process, Yeh et al. does not mention why it would be advantageous. However, Yeh et al. is the primary reference. Nevertheless, it is obvious and common sense to one of ordinary skill in the art that when one desires to clean the substrate holder during a chamber cleaning process the wafer should be removed. Because the substrate holder is also part of the chamber, it is exceedingly obvious that residue will eventually build up

on the holder as well and will eventually need cleaned. Also, there are two options when cleaning an entire chamber as taught by Yeh. The wafer is either present on the substrate holder or it isn't, and removing a substrate from a substrate holder is most definitely within the technical grasp of one of ordinary skill in the art. According to *KSR International Co. v. Teleflex Inc.,* 550 U.S.--, 82 USPQ2d 1385 (2007): "a person of ordinary skill has good reason to pursue the known options with his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense."

The applicant argues that Yeh et al. teaches a wafer less cleaning process while the secondary references do not, and therefore one of ordinary skill in the art would not combine the references. In the rejection of the previous office action (and below), Yeh is used to teach the cleaning process with oxygen plasma, Suda teaches that one may substitute CO or CO_2 for oxygen when using oxygen plasma, and Sieber or Imai show that oxygen plasma is useful in removing fluorocarbon residue. Whether or not the secondary references have a wafer or not is not critical to the rejection nor would be critical to one of ordinary skill in the art while using this prior art. One of ordinary skill in the art would readily combine these references based upon their common objectives of using oxygen plasma to clean or etch surfaces.

The applicant further argues that the combination does not teach just using argon gas with CO. Suda et al. teaches that CO gas or CO with nitrogen and argon may be used as an alternative to oxygen gas to generate oxygen plasma (paragraph 0082). In addition, it is well known in the art that as both nitrogen and argon are inert gases, a

mixture of the two gases substituted for one or the other also yields predictable results and is obvious. This limitation would have been obvious because the substitution of one known element, such as argon, for another, such as nitrogen would have yielded predictable results and is therefore obvious to one of ordinary skill in the art at the time of the invention. See *KSR International Co. v. Teleflex Inc.*, 550 U.S.--, 82 USPQ2d 1385 (2007). Though the applicant cites advantages the applicants have found in relation to using CO and Ar in the chamber cleaning process, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter.1985). These advantages that the applicant cites by using the instant drawings are also not convincing. The data in the figures are taken with several different pressures as seen in Figure 6. From just the data given, it is impossible to see whether or not the differing results are from the mixture of gases or just the pressure differentials.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Kelly M Stouffer/

Examiner, Art Unit 1792

Conferees:

/Timothy H Meeks/

Supervisory Patent Examiner, Art Unit 1792

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QAS, TC1700